

CLAIMS

What is claimed is:

1 1. A data converter for converting a group of vectors from a time serial to a time parallel
2 format, wherein in the time serial format, sets of corresponding components of the vectors each
3 have a time slot, and in time parallel format, each vector has a time slot, the converter comprising:
4 an input rotator configured to rotate each set of corresponding components of all
5 vectors by an amount that depends on the time slot of the set of corresponding components;
6 a bank of register files coupled to the input rotator to receive the rotated set of
7 corresponding components, and having a register file in the bank configured to store each rotated
8 set of corresponding components;
9 an output rotator coupled to the bank of registers files, for receiving and rotating the
10 components of a vector an amount that depends on the time slot of the vector; and
11 a controller configured to control the addressing of the bank of register files when
12 the corresponding components of each vector are stored in a register of the bank, and to control the
13 addressing of the bank to collect the components of each vector for subsequent output rotation.

1 2. The data converter of claim 1,
2 wherein each vector has n components indexed from 0 to $n-1$ such that there are 0 to
3 $n-1$ sets of corresponding components; and
4 wherein the amount of rotation by the input rotator is zero for the 0th set of
5 corresponding components, and $n-1$ steps clockwise for the $(n-1)$ th set, any intervening sets of
6 corresponding components being rotated by an amount equal to the ordinal number of the set.

1 3. The data converter of claim 1,
2 wherein there are n vectors indexed from 0 to $n-1$; and
3 wherein the amount of rotation by the output rotator is zero for the 0th vector and $n-1$
4 steps counter-clockwise for the $(n-1)$ th vector, any intervening vectors being rotated by an amount
5 equal to the ordinal number of the vector.

1 4. The data converter of claim 1, wherein each register file in the bank includes a register for
2 storing the vector components.

1 5. The data converter of claim 4, wherein each vector has n components and each register
2 file in the bank has n component registers.

1 6. The data converter of claim 5, wherein there are n register files in the bank.

1 7. The data converter of claim 1, wherein the bank of register files is configured to write and
2 read the vector components at the same clock cycle.

1 8. The data converter of claim 1, wherein the controller can alternate between horizontal
2 writing and reading operations and vertical writing and reading operations on the bank of register
3 files.

1 9. The data converter of claim 8, wherein the vector has n components and the controller
2 horizontally writes n sets of corresponding components and horizontally reads n vectors.

1 10. The data converter of claim 9, wherein, after the controller horizontally writes n sets of
2 corresponding components and horizontally reads n vectors, the controller vertically writes n sets of
3 corresponding components and vertically reads n vectors.

1 11. The data converter of claim 1, wherein the output rotator rotates the vector component a
2 position equal and opposite to the input rotator.

1 12. A method for converting a group of vectors from a time serial to a time parallel format,
2 wherein in the time serial format, sets of corresponding components of the vectors each have a time
3 slot, and in time parallel format, each vector has a time slot, the method comprising:

4 for each set of corresponding components, rotating the corresponding components an
5 amount that depends on the time slot of the corresponding component and writing each set of
6 rotated corresponding components in a separate set of registers in a bank of register files; and

7 for each vector in the group, reading selected registers in the bank to collect the
8 components of the vector and rotating the collected components of the vector an amount that
9 depends on the time slot of the vector.

1 13. The method of claim 12, wherein if the vector components are written horizontally to the
2 bank of register files, then the vector components are read horizontally from the bank of register
3 files.

1 14. The method of claim 12, wherein if the vector components are written vertically to the
2 bank of register files, then the vector components are read vertically from the bank of register files.

1 15. The method of claim 12, wherein a set of corresponding components is written and the
2 components of a vector are read in the same clock cycle.

1 16. The method of claim 12,
2 wherein the vector has n components; and
3 wherein n sets of corresponding components are horizontally written over n clock
4 cycles and vectors are horizontally read over the same n clock cycles.

1 17. The method of claim 16, wherein in another n clock cycles subsequent to the n clock
2 cycles, n sets of corresponding components are vertically written over n clock cycles and vectors
3 are vertically read over the same n clock cycles.

1 18. An data converter for converting a group of vectors from a time serial to a time parallel
2 format, wherein in the time serial format, sets of corresponding components of the vectors each
3 have a time slot, and in time parallel format, each vector has a time slot, the converter comprising:

4 input rotation means for rotating each set of corresponding components of all vectors
5 by a first prescribed amount depending on the particular set;

6 storage means coupled to the input rotation means, for storing the rotated set of
7 corresponding components; and

8 output rotation means coupled to the storage means, for receiving components of a
9 vector from the storage means and rotating the components of the vector by a second prescribed
10 amount depending on the particular vector.

1 19. The data converter of claim 18, wherein:

2 the input rotation means is an input rotator configured to rotate each set of
3 corresponding components of all vectors by an amount that depends on the time slot of the set of
4 corresponding components;

5 the storage means is a bank of register files with a register file in the bank
6 configured to store each rotated set of corresponding components; and

7 the output rotation means is an output rotator configured to receive and rotate
8 the components of a vector an amount that depends on the time slot of the vector.

1 20. The data converter of claim 19, wherein the storage means is configured to write and
2 read the vector components in the same clock cycle.

1 21. The data converter of claim 20, wherein the storage means is configured to write
2 corresponding components horizontally and then read vectors horizontally over a prescribed number
3 of clock cycles.

1 22. The data converter of claim 21, wherein, during another prescribed number of clock
2 cycles, the storage means is configured to write corresponding components vertically and then read
3 vectors vertically.

1 23. The data converter of claim 18 further comprising controller means communicably
2 coupled to the input rotator means, the storage means and the output rotator means, for controlling
3 the operations thereof.

1 24. The data converter of claim 23, wherein the controller means is operable to control the
2 writing and reading of the vector components to the storage means and operable to control the
3 rotation of the vector components by the output rotation means and the input rotation means.

1 25. The data converter of claim 18, wherein the output rotation means rotates time parallel
2 vector components in a direction opposite to the direction that the input rotation means rotates a set
3 of corresponding vector components.
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